WEIGHT BEARING SYSTEMS AND METHODS RELATING TO SAME

This application claims the benefit of U.S. Application No. 09/282306, filed March 31, 1999, which claims the benefit of U.S. Provisional Application No. 60/118952, filed February 5, 1999, each of which is incorporated herein by reference in its entirety.

Field of The Invention

The field of the invention is weight bearing systems such as studs, joists, beams, and related devices and methods.

Background of The Invention

Weight bearing systems comprise primary weight bearing elements such as studs and joists, and secondary weight bearing elements such as rim bands and end caps. Such weight bearing elements are common components in many constructions. For example, floor and ceiling joists function as weight bearing elements and are frequently found in residential and commercial buildings. Although there is a large variety of weight bearing elements, many weight bearing elements are limited in length and weight bearing capacity due to the material(s) from which they are constructed, and are oftentimes difficult to incorporate into constructions because of their structure or cost.

Primary Weight Bearing Elements

Primary weight bearing elements can be grouped in two classes, elements predominantly made from wood, and elements predominantly made from metal. Generally, primary weight bearing elements made from wood are found in older constructions, and were traditionally made from solid saw lumber. However, due in part to a sharp decline in the supply of appropriate solid saw lumber, alternative primary weight bearing members which use less solid saw lumber were developed. Such alternatives generally comprise two chords (a top, compression chord/member and a bottom, tension chord/member extending the length of the primary weight bearing element) coupled together by a web (see U.S. Patent No. 5,664,393 issued on September 9, 1997 to Veilleux et al., U.S. Patent No. 5,560,177 issued on October 1, 1996 to Brightwell, and U.S. Patent No. 4,228,631 issued on October 21, 1980 to Geffe). A commonly found alternative is an I-joist having sawn lumber chords or plywood chords. Such an alternative element advantageously reduces the amount of wood required for construction and thereby reduces the weight of the primary weight bearing element. However, almost all forms of wooden primary

weight bearing elements are relatively heavy when compared to equivalent metal structures. Moreover, wooden primary weight bearing elements are oftentimes limited to lengths of about less than 24'.

Generally, primary weight bearing elements made from metal are lighter than comparable wooden elements, may span longer distances and are fireproof. Furthermore, such elements are often available in continuous lengths. Primary weight bearing elements made from metal are common in various forms, including light gauge steel C-profile joists, trichord open web joists and screw fabricated steel truss joists (see U.S. Patent No. 5,687,538 issued on November 18, 1997 to Frobosilo et al., U.S. Patent No. 5,499,480 issued on March 19, 1996 to Bass, U.S. Patent No. 5,457,927 issued on October 17, 1995 to Pellock et al., U.S. Patent No. 5,157,883 issued on October 27, 1992 to Meyer, U.S. Patent No. 4,793,113 issued on December 27, 1988 to Bodnar, U.S. Patent No. 4,729,201 issued on March 8, 1988 to Laurus et al., U.S. Patent No. 4,159,604 issued on July 3, 1979 to Burrell, U.S. Patent No. 3,686,819 issued on August 29, 1972 to Atkinson, U.S. Patent No. 3,541,749 issued on November 24, 1970 to Troutner, U.S. Patent No.3,221,467 issued on December 7, 1965 to Henkels, U.S. Patent No. 2,578,465 issued on December 11, 1951 to Davis, Jr. et al., U.S. Patent No. 2,387,432 issued on October 23, 1945 to Laney, and U.S. Patent No. 157,994 issued on April 4, 1950 to Palmer).

Light gauge steel C-profile joists may be manufactured from roll-formed galvanized steel. However, in order to achieve appropriate rigidity, light gauge steel C-profile joists are oftentimes made from 16-gauge steel, which tends to be more difficult to drill or perforate. Furthermore, additional elements are oftentimes difficult to attach to light gauge steel C-profile joists.

Trichord open web joists are generally more rigid than light gauge steel with C-profile but often have to be custom manufactured to fit span, load, etc. A further common disadvantage of trichord open web joists is that they are difficult to attach or to join with hangers.

Screw fabricated steel truss joists often suffer from 4 common drawbacks: They are labor-intensive, expensive in manufacturing, have to be custom made and tend to loosening of screws leading to impaired stability and additional wear.

Secondary Weight Bearing Elements

Rim bands are used to couple a structural element such as a joist to an adjacent structural elements such as wall studs. A simple rim band might have a "C" shape comprising one vertical segment and two horizontal segments, with the vertical or "back" segment tending to be substantially longer than the "top" and "bottom" horizontal segments or "legs". One drawback of many rim bands is the tendency for the back to buckle. This tendency is generally compensated for by mounting the rim band to the side of one or more structural members such as a beam or studs such that compression forces are born primarily by the supporting structural member(s) rather than the rim band. An example of a rim band which is mounted in such a fashion can be found by referring to U.S. Patent No. 5,956,916 issued on September 28, 1999 to Liss. The rim band/ledger beam of Liss comprises a standard C shape with shear tabs punched out of and folded away from the back segment of the rim band. The rim band of Liss, although suitable in many applications, also suffers from the drawback that the shear tabs comprise a single piece folded out from the center of the back of the rim band. The centered shear tabs do not extend to the portions of the back adjacent to the top and bottom horizontal segments and thus would provide poor, if any, coupling to a joist comprising top and bottom cords as described above. Difficulty in attaching joists is a drawback of many rim bands. Moreover, if the sheer tabs did extend the entire length of the back, the rim band would have a tendency to bend under vertical loads at points where the shear tabs were located as only the horizontal legs of the rim band would be left to provide support at such points. Also, forming the bend causing the shear tabs to be positioned perpendicular to the back of the rim band may require more force than can easily be achieved at a work site. Yet another drawback found in some rim bands is the lack of a common rim band for use in structures having differently spaced joists.

Thus, there is still a need for improved weight bearing systems and methods to produce improved weight bearing elements.

Summary of the Invention

The present invention is directed to improved weight bearing elements and methods relating to same. Some such elements are contemplated as having a web, and a chord connected to the web, the chord perimeter having a cross-sectional shape of a closed multi-sided figure having at least 5 sides, at least two of which are substantially parallel to the web. Some

members may have chords which have a pentagonal cross sectional shape, and/or may include load transferring members or end-caps.

Other elements may comprise a stiffened rim band having pairs of die cut tabs and/or stiffening ribs positioned along the member/rim band. Some such elements comprise pairs of die cut tabs positioned along the length of the member at intervals which are a fraction of the distance used in standard joist spacings. Other elements comprise one or more pairs of die cut tabs positioned directly opposite each other such that one tab is adjacent the top of the rim band while the corresponding tab is adjacent the bottom of the rim band. Still other elements may comprise a diamond shape stiffener extruding from the back of the rim band and possibly formed by punching a slot into the back of the rim band and pushing the ends of the slot out from the back so as to form the diamond shape.

In some embodiments, the weight bearing elements disclosed herein may be "roll-formed" from a continuous sheet of material such as light gauge galvanized steel. In other embodiments, they may exhibit one or more of the following feature: improved load bearing capacity; lighter weight; reduced material usage; easier to manufacture and/or install; able to be cut to custom lengths.

Although joists are only a subset of the primary weight bearing elements to which the disclosed subject matter applies, the term "joist" will be used frequently hereafter to refer to all primary weight bearing elements in order to make this disclosure easier to read. Similarly, the term "rim bands" will be used frequently hereafter to refer to all secondary wait bearing elements. The term polygonal as used herein includes figures in which the bounding line segments are joined by curves as well as more traditional "angular" figures.

Various objects, features, aspects and advantages of the present invention will become more apparent from the following detailed description of preferred embodiments of the invention, along with the accompanying drawings in which like numerals represent like components.

Brief Description of The Drawings

Figure 1 is a perspective view of a joist embodying the invention.

Figure 2 is a cross-sectional view of the joist of Figure 1.

Figure 3 is a perspective view of a joist and load transfer member combination embodying the invention.

Figure 4 is a perspective view of a joist and end cap combination embodying the invention.

Figure 5 is a perspective view of a back-mounted end cap.

Figure 6 is a perspective view of a joist being connected to a "track" type support via a back mounted end-cap.

Figure 7 is a perspective view of a back and bottom mounted endcap.

Figure 8 is a perspective view of the endcap of figure 7 being used to connect a joist to a "rail" type support via a back and bottom mounted endcap.

Figure 9 is a perspective view of a rim band embodying the invention.

Figure 10 is a plan view of a cut sheet prior to its being folded into the rim band of Figure 9.

Figure 11 is a side view of the rim band of figure 9.

Figure 12 is a top view of the rim band of figure 9.

Figure 13 is a detail view of one of the diecut tabs of the rim band of figure 9.

Figure 14 is a front view of one of the stiffeners of the rim band of figure 9.

Figure 15 is a side view of one of the stiffeners of the rim band of figure 9.

Figure 15 is a perspective view of a rim band and joist according to the claimed invention.

Figure 16 is a perspective view of a rim band and joist according to the claimed invention.

Figure 17 is a perspective view of a support system according to the claimed invention having showing how joists can be coupled to every other pair of diecut tabs to space the joists 16" intervals.

Figure 18 is a perspective view of a support system according to the claimed invention having showing how joists can be coupled to every third pair of diecut tabs to space the joists 24" intervals.

Figure 19 is a perspective view of a rim band embedded in a wall and providing support to upper studs.

Figure 20 is a perspective view of a rim band embedded in a solid wall.

Detailed Description

Joist

Referring to Figures 1 and 2, a preferred primary weight bearing element/joist 10 comprises top/tension and bottom/compression chords 100 and web 200. Chords 100 comprise a top supporting side 110, a left supporting side 120A, a right supporting side 120B, and left and right transition sides 130A, and 130B. Web 200 comprises body 210, flanges 220, fasteners 230, and chord lips 240. Referring to Figure 2, the perimeters of chords 100 of joist 10 can be seen to have a polygonal cross sectional shape having 5 sides, at least two of which are substantially parallel to the web.

In preferred embodiments, supporting side 110 couples the two parallel sides 120A and 120B to each other and provides a load bearing surface. Sides 120A and 120B are substantially parallel to each other and to the body 210 of web 200. Sides 110, 120A, 120B, 130A and 130B can be seen to be planar and to compose parts, via their exterior surfaces 111, 121A, 121B, 131A, and 131B, of the perimeter surface of the chord and to define a cavity 300 via their interior surfaces 112, 122A, 122B, 132A, and 132B, which are not part of the perimeter surface of the chord. Thus, cavity 300 is adjacent to and partially forms a cavity located within the perimeter surface of the chord. Chords 100 are generally parallel to each other, and the cavities 300 contained within them extends the length of the chords 100.

In joist/primary weight bearing element 10, the 5 planar sides 111, 121A, 121B, 131A, and 131B can referred in a number of ways. It is contemplated that referring to side 111 as the

top mounting surface of chord 10, side 121A as the left mounting surface of chord 10, side 121B as the right mounting surface of chord 10, side 131A as the left transition surface of chord 10, and side 131B as the right transition surface of chord 10 may be beneficial. Using such terms to distinguish between the sides, it can be seen that joist 10 and its sides have the following features: the left side mounting surface 121A and the right side mounting surface 121B are each substantially parallel to body 210 of web 200; the top mounting surface 111 is substantially perpendicular to the web body 210; the left side mounting surface 121A, the right side mounting surface 121B, the left transition surface 131A, and the right transition surface 131B each comprise a top edge and a bottom edge with the top edge of each of the left side mounting surface 121A and right side mounting surface 121B being coupled to the top mounting surface 111, the bottom edge of the left side mounting surface 121A being coupled to the top edge 111 of the left transition surface 131A, and the bottom edge of the right side mounting surface 121B being coupled to the top edge of the right transition surface 131B; the left and right transition surfaces 131A and 131B extend away from all of the top mounting surface 111, the left mounting surface 121A, and the right mounting surface 121B; and the bottom edge of each of the left transition surface 131A and right transition surface 131B are coupled to the web 200.

It is contemplated that alternative embodiments of primary weight bearing elements may have A planar sides where A is one of 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, or A is greater than 15.

Because chords 100 comprise planar, i.e. relatively flat and thin, sides connected together, it is possible to form chords 100 from a sheet of thin material such as galvanized steel by simply bending the material into the pentagon shape of the chords 100. It is contemplated that alternative embodiments may utilize various gauges of steel including, but not necessarily limited to 18 gauge and 20 gauge. It is also contemplated that alternative embodiments of primary weight bearing elements may have sides which are less than N inches thick where N is one of 1, .75, .5, .25, .125, and .1.

The cavity 300 within one or more of chords 100 may be filled with a material 300A so as to increase the weight or modify the weight distribution of the joist/primary weight bearing element 10. Thus, some embodiments may be ballast (from top to bottom) weighted as in a floor joist, or a drag (from bottom to top) weighted as in a ceiling joist. The material or materials used may be uniform throughout the cavity or may comprise separate elements located within the

cavity 300. The materials used may also be used to modify other features of the joist other than weight including, but not limited to, buoyancy and rigidity.

Web 200 is preferred to be formed from the same sheet of material as chords 100. It is also preferred that web 200 be "open" in the sense that portions of the web body 210 are removed, preferably by punching, to create the pattern shown in Figures 1 and 2, as well as to form flanges 220. Web 200 is also preferred to comprise fasteners 230 for fastening chord lips 240 to body 210.

End Cap

It is also contemplated that joists 10 may be used in combination with load transferring studs 400 as shown in Figure 3, or couplers 500 as shown in figures 4-8. Load transfer studs may be comprised of flat plates and/or more 3-dimensional shapes such as that shown in load transfer stud 400 of Figure 3. The size and dimensions of various embodiments of transfer studs 400 may vary, as may the method and materials used to form them, so long as they serve to transfer load forces from one chord to another so as to lessen the load on web 200. Couplers 500 can be used to couple joist 10 to a second joist or to some other object. It is contemplated that in some embodiments, a particular device may function as both a load transfer stud 400 and a coupler 500. As with transfer studs 400, the size and dimensions of various embodiments of couplers 500 may vary, as may the method and materials used to form them, so long as they serve to couple a joist 10 to a second joist or another object. Transfer studs 400 and couplers 500 may also vary as to the manner in and/or location at which they are coupled to joist 10. Some embodiments may thus attach at the ends using screws, while others may be coupled to a non-end portion of the joist, may be fastened by welding or some other means, and may be coupled to one or more sides of chords 100 or to a portion of web 200. Various methods of using transfer studs 400 and couplers 500 are pictured in Figures 3-8.

It should be noted that the use of parallel sides 120A and 120B on chords 100 provide a flat surface to which sides 430 of transfer studs 400 and sides 530 couplers 500 can be attached. It is contemplated that some embodiments will include pre-drilled holes in chords 100 and in the back 410 and sides 430 transfer studs 400, and in the back 510 and sides 530 of couplers 500 to facilitate the fastening of such studs 400 and couplers 500 to joists 10 via chords 100 through the use of screws or other fasteners.

Referring to figures 5-8, alternative forms of couplers/end caps 500 are shown. It is contemplated that an end cap 500 such as that of figure 5 is particularly suitable for mounting via sides 530 to a joist 10 and via back 510 to another support such as a joist 10 or the track support 610 of figure 6. It is also contemplated that an end cap 500 such as that of figure 6, because it comprises flanges 520, will be particularly suitable for mounting to a rail support 620 of figure 8.

Rim Bands

Referring to figure 9, a secondary weight bearing element/rim band 800 comprises a C shape comprising back/vertical segment 810, upper leg/horizontal segment 820, and lower leg/horizontal segment 822. Rim band 800 also comprises stiffeners 840, upper die cut shear tabs 831 and lower die cut shear tabs 832.

Back 810 may vary in height but is preferred to be approximately 12" high. Similarly, the width of upper leg 821 and lower leg 822 may vary, but upper leg 821 is preferred to have a width of 2" while lower leg 822 is preferred to have a width of 2". Thus, a preferred rim band can be formed by folding a sheet of metal approximately 16" wide into a C shape having sides of 2", 12", and 2". Less preferred embodiments may comprise a single side/back 810 without legs 821 and 822. It is contemplated that alternative embodiments may utilize various gauges of steel including, but not necessarily limited to 18 gauge and 20 gauge. It is contemplated that any length, width, or height may fall within a range of plus or minus 6" or smaller of the specified length, width or height unless such variation is expressly prohibited herein.

Die cut shear tabs 831 and 832 comprise pairs of tabs positioned opposite each other long the rim band with each pair of tabs being used to couple a joist to the rim band. A given pair of tabs will comprise one upper tab 831 positioned adjacent the upper leg 821 of rim band 832 so that it can readily be coupled to the upper chord of a support member 10, and a lower tab 832 positioned adjacent the lower leg 822 of rim band 832 so that it can readily be coupled to the lower chord of a support member 10. In preferred embodiments where back 810 is 8.5" high, shear tabs 831 and 832 will be separated from each other by a distance of 8.5", and each will be separated from the nearest leg by less than .5" or less than .25".

In alternative embodiments, sets of tabs having more than two sets of tabs per set may be utilized. It is contemplated that in such embodiments the tabs would be vertically aligned in a fashion similar to the pairs of tabs of figures 9-20 for use on structural members having

sufficient side surface area for coupling to all of, or at least a subset of the tabs. Thus embodiments comprising sets of vertically aligned tabs wherein the sets comprise 3, 4, 5, 6, or more tabs are contemplated wherein all or a subset of tabs may be suitable for use with a given joist type.

Die cut shear tabs 831 and 832 are preferred to be uniform in size throughout rim band 800 although they may very in size and shape in less preferred embodiments. Die cut shear tabs are preferred, referring to figure 13, to be formed by creating .16" wide, U-shaped cut in back 810 of rim band 800, with the "U" having a base width of 1.2" of one side and a height of 1.9" for the remaining two parallel sides. The size and shape of shear tabs 831 and 832, either individually or in plural may vary in size and/or shape.

Each shear tab 831 or 832 is preferred to comprise a plurality of holes positioned long the length of the tab parallel to the sides of rim band 800 such that fasteners such as screws and or nails can pass project through the holes into and in a line parallel to the chords of joist 10.

Referring to figures 10-13, shear tabs 831 and 832 are preferred to be spaced along the length of rim band 800 such that the separation between centers of adjacent shear tabs is such that it is a fraction of at least two standard joist spacings. As an example, joists are typically spaced at 16" and 24" intervals. By spacing shear tabs 831 and 832 at 8" intervals, a single rim band can be used regardless of whether 16" or 24" spacing is chosen by placing joists and every other or every third pair of shear tabs. Cutting tabs at 9.6" centers to accommodate placing joists at 19.2" centers is also contemplated.

Stiffening members 840 are, referring to figures 14 and 15, preferred to comprise a diamond shape having a cutout center. By punching, cutting, or otherwise creating an elongated aperture 841 in back 810, the sides of the aperture thus formed can be pushed or otherwise forced away from the back 810 of rim band 800 so as to form a diamond shape comprising sides 841a-c, perimeter outer perimeter 843, and inner perimeter 844. Although the actual dimensions of stiffening member 840 may vary, preferred embodiments will have a length between tips of the outer perimeter 843 of 8", and approximately 3" for inner perimeter 844. Stiffening members 840 are also preferred to extrude from back 810 for a height of .4" at their centers, and .15"-.2" near the upper and lower points of perimeters 843 and 844. A preferred diamond shape consists essentially of four sides forming two Vs positioned adjacent to each other but with opposite

orientations. Each V has an angle formed by its two sides which is greater than 5 or 10 degrees, but less than or equal to 45 degrees, and the angles between adjacent sides of the Vs where they are coupled together are preferably greater than or equal to 135 degrees but less than 170 or 180 degrees. Less preferred embodiments may have different angular relationships between sides and/or may utilize more or less than four sides.

Less preferred embodiments may utilize smaller stiffening members shaped similarly to those described above. Such embodiments may utilize two or more vertically aligned stiffening members rather than a single larger stiffening member, or may utilize smaller stiffening members arranged in some other pattern.

It is contemplated that weight bearing systems comprising rim band 800 will benefit from reduced shear. It is also contemplated that the tabs 831 and 832 help strengthen rim band 800. It has been observed that a rim band with and effective 8" track/back height is stiffer than one with a 10" track.

Weight Bearing Elements in General

It is contemplated that weight bearing elements according to the subject matter disclosed herein may vary greatly in size. Thus smaller primary weight bearing elements may be used in, among others, prosthetic devices including but not limited to dental implants covering multiple teeth and long bone replacements, household utensils, cars, small planes, scaffolding, and furniture. Larger elements may be used in, among others, bridges, oil tankers, large planes, and lightweight ladders.

It is contemplated that various embodiments of the weight bearing elements disclosed herein may be formed from one or more materials. Such materials may include, but are not necessarily limited to: a metal such as stainless steel, aluminum, galvanized steel, and iron; polymers such as PVC, thermoplastic, inflexible polyethylene, and polycarbonate, polypropylene, and polyethylene (such polymers may be provided in granules, in an unpolymerized for, and/or in sheets of flexible polymers); fibrous man-made material including, but not limited to, glass-/carbon fibers hardened with resins; and elemental metals including magnesium.

Methods of Formation

It is contemplated that weight bearing elements according to the subject matter disclosed herein may be formed in a number of methods involving steps which include, but not limited to: pre-forming such as by rolling from a coil and/or plates of precut lengths; and preprocessing such as by coating, cutting, and/or punching.

One method of forming a primary weight bearing element/support member 10 according to the claimed subject matter might simply involve roll forming a sheet of metal into the shape shown in Figures 1 and 2 by bending each side of the sheet six times so as to form a pentagonal chord 100 and chord lip 240, and then fastening, possibly through the use of adhesives, screws, welding, or a clench press, chord lip 240 to body 210. Such a method could also include a step of punching out portions of body 210 so as to form a web pattern and flanges 220 as shown in the figures.

Another method involves the use of polymers which may be deformed from a sheet into a pentagonal shape and then fixed by heat and/or glue. Similarly, granules or unpolymerized material may be filled into a mold and symmetrical portions cast with such portion then being fixed together by heat, ultrasound, glue, etceteras. In yet another example, a fibrous man-made material is wrapped around templates to create a first, immature form, which will be modified into a second, mature form by applying resin or other polymer to harden the fiber mats. In yet one more example magnesium may be poured into a mold to obtain a first, immature form of the product which will then be fixed by heat to form a second, mature form.

One method of forming a secondary weight bearing element/support member 800 according to the claimed subject matter might simply involve (1) folding the sides of a sheet of metal to form a standard C shape comprising upper leg/horizontal segment 821, lower leg/horizontal segment 822, and back/vertical segment 810; (2) making the die cuts to form upper shear tabs 831 and lower shear tabs 832; and (3) forming stiffeners 840, possibly by a combined punch and press operation. Shear tabs 831 and 832 can either be folded outward from back 810 during manufacture, or, more preferably, can be folded out as needed during weight bearing system assembly. The actual order of formation of the various components of element 800 may be varied. Although die cutting the tabs is preferred, any method which allows for formation of sets of vertically aligned tabs along the length of the rim band may be utilized.

Methods of Use

In addition to the methods explicitly and inherently disclosed above, weight bearing systems according to the claimed invention may be used in building a structure by, referring to Figure 19: (1) providing a rim band 800; (2) positioning the rim band on top of one or more lower studs 912; (3) coupling one or more joists 10 to the rim band such that the combination of rim band 800 and lower studs 912 at least partially supports the one or more joists 10; (4) positioning one or more upper studs 911 on top of the rim band 800 such that the combination of rim band 800 and lower studs 912 at least partially supports the upper studs 911. In some methods, the rim band 800 provided may comprise upper and lower horizontal segments 821 and 822 wherein the lower horizontal segment 822 rests on and is coupled to the lower studs 912 and the upper studs rest on and are coupled to the upper horizontal segment 911. In other methods, the end of a joist 10 is positioned between the upper and lower segments 821 and 822 of the rim band 800 such that it is directly above a lower stud 912 and directly below an upper stud 911. In such methods it is preferred that one side of each of the upper stud 911, the lower stud 912, and the joist 10 have a side positioned in or adjacent to a common vertical reference plane A, or, even more preferably that a second side of each of the upper stud 911, the lower stud 912, and the joist 10 also have a side positioned in or adjacent to a second common vertical reference B plane, the second vertical reference plane being parallel to the first vertical reference plane. In many instances, the end of joist 10, the back of rim band 800, and a third side of studs 911 and 912 will be positioned in or adjacent to a third vertical reference plane C where C is perpendicular to reference planes A and B.

It is contemplated that vertically aligning a lower stud 912, and upper stud 911, and a joist 10 permits rim band 800 to support upper stud 911. In such an instance it is contemplated that joist 10 obtains support from lower leg 822 and possibly back 810 of rim band 800 while providing sufficient support to upper leg 812 to prevent it from bending or otherwise deforming under the load transferred to it via upper stud 911. Although alternative embodiments may not match joists 10 to pairs of vertically aligned upper and lower studs 911 and 912 on a one for one basis, it is preferred that embodiments placing upper stud 911 on top of rim band 800 have at least one joist vertically aligned which each pair of vertically aligned studs. Track 913 may also be incorporated into the system so as to provide additional stability to upper and/or lower studs 911 and 912 and to facilitate coupling the studs to the rim band 800 and/or another structural member such as floor 930.

Referring to Figure 20, another method of use of a rim band as described herein is to at least partially imbed it within a wall (or floor or other structural member), possibly by using as a form member during formation of a concrete wall. Although many types of rim bands may be suitable for such a use, the rim band described herein is particularly suitable as the die cut shear tabs can be folded out as necessary after the wall has been formed to provide ready attachment of joists without requiring insertion of fasteners into the wall. Although the need for stiffening members 840 is less apparent when back 810 is supported by an adjacent surface, stiffeners 840 may function to prevent lateral movement of rim band 800 after the wall is formed, and may prevent buckling of the rim band during wall formation.

In preferred methods, the rim band and/or joists will comprise one or more of the rim bands or joists as previously described and as claimed herein.

Thus, specific embodiments and applications of primary and secondary weight bearing elements and related methods have been disclosed. It should be apparent, however, to those skilled in the art that many more modifications besides those already described are possible without departing from the inventive concepts herein. The inventive subject matter, therefore, is not to be restricted except in the spirit of the appended claims. Moreover, in interpreting both the specification and the claims, all terms should be interpreted in the broadest possible manner consistent with the context. In particular, the terms "comprises" and "comprising" should be interpreted as referring to elements, components, or steps in a non-exclusive manner, indicating that the referenced elements, components, or steps may be present, or utilized, or combined with other elements, components, or steps that are not expressly referenced.